

THERAPEUTIC BENEFITS RESULTING FROM COMBINING AAC WITH ENVIRONMENTAL CONTROL SYSTEMS

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Abstract: Using Alternative and Augmentative Communication (AAC) devices in combination with Environmental Control Systems (ECS) offers two benefits for severely and multiple impaired children. First of all, they are in a position to overcome some of their communication and manipulation barriers. Second, the use of these tools in the hands of dedicated therapists and pedagogues can contribute significantly to the mental and cognitive development of severely impaired children.

Introduction

One of the main reasons for severe motor- and multiple impairments in childhood is cerebral palsy. Here different brain regions can be affected resulting in random combinations of disabilities (motor, cognitive, communication, intellectual etc.).

For severely motor impaired persons the implementation of so called *Environmental Control Systems (ECS)* can mean all the difference between inability and independent living. The ECS establishes a custom tailored interface between the user's residual abilities and his or her physical environment by providing the possibility to operate electrical appliances, communications devices, doors and windows and a host of other things by remote control.

The goal of *communication aids (Augmentative and Alternative Communication = AAC)* is to facilitate interpersonal- and tele-communications for persons who are not able to communicate in the usual manner.

For both applications, ECS and AAC, multimedia PC technology constitutes an ideal tool by offering all the prerequisites for translating between the impaired user and the environment.

Materials/Method

For several years now our research group has been involved in the development and field-testing of a combined ECS and AAC system we named AUTONOMY. It is based on a PC hardware platform (notebook or a handheld computer) and on the MS-Windows operation system. The input/output hardware can be chosen from a wide range of standard and special devices to meet the specific needs of the disabled user. A set of peripheral hardware components links the system to the physical environment.

AUTONOMY was implemented into a smart-room at a support centre for severely and multiple impaired children at Axams, Tyrol. By using the EIB (European

Installation Bus) for the electric wiring and infrared remote control technology, all appliances in the room can be remote-controlled via the system. AUTONOMY usually is placed on a trolley. Thus the user can turn it to face any direction. Figure 1 shows a floor plan of the smart-room.

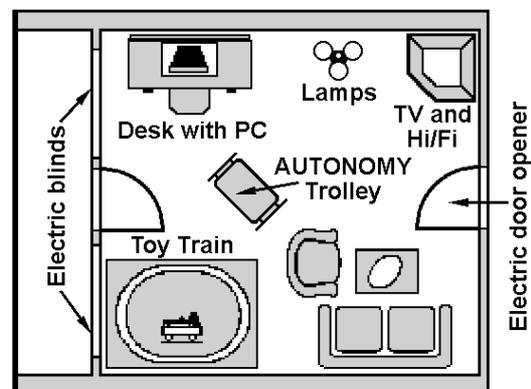


Figure 1: The AUTONOMY Smart-Room in Axams

Results

When operating AUTONOMY as an ECS the teacher or therapist will create a system-configuration like the one shown in Figure 2. The icons directly correspond to environmental commands (switching on the lamps, starting the CD-player, get the toy-train running, switch off everything).

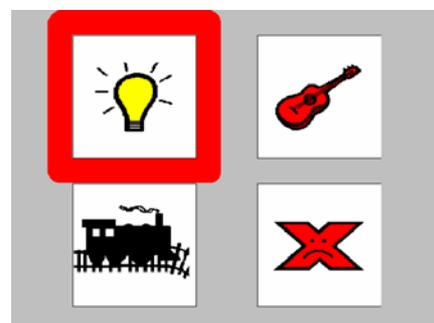


Figure 2: Simple ECS Screen

For AAC purposes configurations showing communication symbols on the screen can be created. Activating an icon by direct selection or scanning will

result in a spoken or printed message. A typical screen is shown in Figure 3, representing one layer of Bliss-Symbols for verbs.

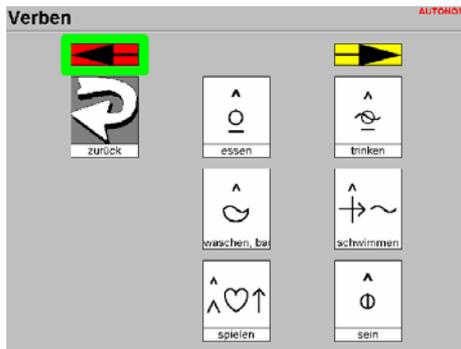


Figure 3: Screen for AAC using Bliss-Symbols

Discussion

One of the main goals in developing AUTONOMY was to provide a configuration interface which enables even complete computer illiterate persons to create client tailored user interfaces and application. The concept received perfect acceptance from teachers and therapists and meanwhile several hundred different configurations were set-up at the test site [1].

The extensive use of AUTONOMY at the support centre in Axams also showed that the system offers additional therapeutic benefits beyond pure AAC and ECS [2].

Especially cognitive and motor impaired children encounter severe problems in experiencing the principle of reason and effect. As their possibilities to handle objects by themselves and perceive what will happen ("...will it drop to the floor and crash when I release it?") are restricted they encounter a deficit along these lines.

The smart-room can help to teach these basic principles. Properly configured, accessing an icon by hitting a switch can cause to start a firework of sound and light. It occurred that children needed such experiences to conceive the concept of reason and effect for their first time.

A next step in therapy can be basic communication training for non-speaking children. The usage of an AAC system is often hard or impossible to explain to severely impaired children. The therapists at Axams, therefore, started to combine AAC with ECS. This has been easy to achieve, as AUTONOMY integrates both function in one platform and under the same user interface.

Figure 4 shows a screenshot from a configuration, where ECS commands and communication contents were mixed. In the first instance, the Bliss-Symbols represent the *words* for TV, VCR or train. However, by activating those icons, not only the words will be *pronounced* (by the speech synthesizer) but there is also *action*: The TV flashes on, the VCR starts, the train gets moving. Thus the intensity of feedback from the environment is significantly increased and the child receives an additional multimodal stimulus.

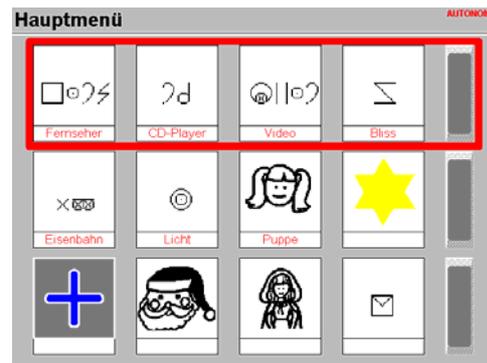


Figure 4: Mixing AAC with ECS for additional stimuli

Conclusion

The response from the field tests on the one hand led to the development of a low-cost version of AUTONOMY which is also suitable for private applications. On the other hand it motivated the launch of the EU-supported R&D project RESORT [3].

The objective of this project is to develop a telematic link between the user or the care person on one side and a service provider (technician, therapist, other experts) on the other side. The link will not only provide video-telephony capabilities but also complete remote controlling the user's PC. Problems with the system, updating of software or changing configurations can be handled in this way. Following the AUTONOMY philosophy the telematic linking will be as easy as clicking on an icon.

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